REMARKS

Claims 1-14 and 17-25 are all the claims pending in the present application. Claims 1 and 21 have been amended to specify that the molecular weight is the weight average molar mass. Support for the amendments can be found, for example, on page 11, lines 1-12 of the specification. New claim 25 has been added, and support for the claim can be found, for example, at page 11, lines 13-15 of the specification.

Since the amendments reduce issues for appeal and no new mater has been added, entry is respectfully requested.

I. Response to Rejection of Claims 1-14 and 17-24 under 35 U.S.C. § 112, second paragraph

Claims 1-14 and 17-24 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite.

The rejection is respectfully traversed.

It is submitted that one of skill in the art would understand molecular weight to be the weight average molar mass, in light of the specification. Specifically, the specification discloses that that the molecular weight refers to the weight average molar mass or Mw at page 11, lines 1-12. Nonetheless, to advance prosecution, claims 1 and 21 have been amended to recite "weight average molar mass."

Accordingly, withdrawal of the rejection is respectfully requested.

II. Response to Rejection of Claims 1-14, 17 and 19-24 under 35 U.S.C. § 103(a)

Claims 1-4, 17 and 19-24 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Ito et al. (US 4,690,856) in view of Gervasi (US 5,939,512).

The rejection is respectfully traversed.

Claim 1 recites a metal laminate comprising between two outer metal sheets an

adhesive polymer layer, characterized in that the adhesive polymer layer comprises polyamide, a copolymer of ethylene and an unsaturated carboxylic acid and/or a derivative thereof and a reactive copolymer, comprising a styrene-maleic acid anhydride copolymer having a weight average molar mass of 1,400 to 10,000.

The purpose of Gervasi is an improvement of a process which produces plastic parts by injection molding. When injection molding is carried out, which is a non-continuous process with very high pressures, fast cycling times are important. Low viscosity and high plastic melt temperatures help reduce cycling times, and shape retention is crucial for the plastic parts.

The solution disclosed by Gervasi is the use of a composition comprising a polyamide (such as Nylon 6), a polyolefinic modifier (such as a polypropylene-based adhesive resin (PLEXAR); *see* col. 3, line 28 and examples), and an ethylene/methacrylic acid copolymer (SURLYN; *see* col. 4, line 2 and examples). Additional constituents may be added in order to further improve the characteristics of the material. Gervasi teaches that a styrene maleic anhydride copolymer (*see* col. 5, lines 47-48) can be added to <u>increase the viscosity,</u> thus improving the shape retention under high temperature conditions (*see* col. 5, line 47 to col. 6, line 1).

It is submitted that one of ordinary skill in the art would not expect the use of styrene-maleic anhydride to decrease viscosity in the present invention based on the disclosure of Gervasi.

That is, in contrast, in the present invention, styrene maleic anhydride is added in the present invention to avoid a viscosity increase. In the making of a sandwich panel, the polymer composition is preferably previously extruded to form a polymer film (*see* page 14, line 20 of the specification). This extrusion process is continuous at lower pressures and lower temperatures than those required for injection molding. In such a process, the control of the

viscosity of the polymer composition is a major prerequisite as the extrusion will not be possible if the viscosity is too high.

As described page 10 of the present specification, it was discovered by the inventors that the mixing of a polyamide with a grafted polyethylene led to an excessive increase of the viscosity. The grafted moieties of the polyethylene indeed reacted with the amine end groups of the polyamide leading to an excess of crosslinking.

To decrease the viscosity, a copolymer of styrene-maleic acid anhydride (used as the "reactive copolymer") was added to the composition, and the styrene-maleic acid anhydride has three technical effects:

1) Decrease of viscosity

The styrene-maleic acid anhydride reacts with the amine end groups of the polyamide, acting thus as a sort of "endcapping agent", thus preventing an excessive amount of grafted moieties of the polyethylene to react with the amine end groups of the polyamide. Adding styrene-maleic acid anhydride therefore avoids the increase in viscosity.

2) Increase of the compatibility between polyamide and polyethylene

Furthermore, styrene-maleic acid anhydride increases the compatibility between polyamide and polyethylene (*see* page 10, line 19 of the specification). Styrene-maleic acid anhydride being a copolymer having a hydrophobic part and a hydrophilic part, it is indeed compatible with both polyamide (which is hydrophilic) and polyethylene (which is hydrophobic). Styrene-maleic acid anhydride thus favors the formation of a polyamide continuous phase (I page 10, line 10 of the specification) while the polyethylene is dispersed in this continuous phase. This compatibility between polyamide and polyethylene is of major importance for the mechanical properties (*e.g.*, tensile modulus, thermal stability) of the polymer composition.

3) Enhance bonding of the adhesive polymer layer with the substrate

Furthermore, styrene-maleic acid anhydride enhances bonding with the substrate (*see* page 10, line 4 of the specification). Both the SMA and the unsaturated carboxylic acid and/or derivatives of the grafted polyethylene (which have not been blocked by the amide end groups of the polyamide) can create a chemical adhesion to the substrate by reacting with the binding groups of the metal (which can be, *e.g.*, hydroxyl-groups in the case of a zinc galvanized steel sheet).

Contrary to the teaching of Gervasi where styrene-maleic acid anhydride is optional, the addition of styrene-maleic acid anhydride is of utmost importance in the case of the present application. Without styrene-maleic acid anhydride, there would be no practical and economically affordable way to produce a plastic core layer with the requested properties: high melting point above 210°C, mechanical stability at this temperature, melting point not higher than about 230°C in order to mechanically form the sandwich structure.

According to the teaching of Gervasi, styrene-maleic acid anhydride is added as a *viscosity increasing additive*, whereas styrene-maleic acid anhydride is added in the adhesive polymer as defined in the present claims to avoid a viscosity increase. Thus, Gervasi clearly teaches away from using styrene-maleic acid anhydride to *avoid a viscosity increase*.

It is respectfully submitted that it would not have been obvious from either Gervasi or Ito that the addition of styrene-maleic acid anhydride would *decrease the viscosity* of the polymer composition, would increase the compatibility between polyamide and polyethylene and would improve the adhesion of the polymer composition on the metal sheets. Accordingly, one of ordinary skill in the art would not have expected the effects of the present invention based on the disclosure of Ito and Gervasi.

In addition, it is submitted that there is no motivation to combine the references. For example, Ito does not teach or suggest that the polyamide adhesive is molded or shaped, or

any desire for the polyamide adhesive to maintain shape a certain shape, and thus one of ordinary skill in the art would not be motivated to add the styrene maleic anhydride copolymer of Gervasi in the adhesive composition of Ito, particularly since the composition of Gervasi is not an adhesive and the adhesive of Ito is not subject to injection molding.

For at least the foregoing reasons, it is submitted that claim 1 is patentable over the cited art.

Further, the present invention preferably contains 2 to 6% styrene-maleic anhydride. Gervasi discloses that styrene-maleic anhydride may be added in an amount of up to about 1% of the total mixture (*see* col. 5, line 49). In addition, based on the examples, Gervasi discloses the addition of styrene-maleic anhydride in an amount of up to 0.8%. Thus, it is submitted that Gervasi neither teaches nor suggests the use of 2 to 6% styrene-maleic anhydride as recited in claim 25.

Moreover, it is submitted that claims 2-14 and 17-25 are patentable over the cited art for the same reasons as claim 1.

Accordingly, withdrawal of the rejection is respectfully requested.

II. Conclusion

In view of the above, reconsideration and allowance of claims 1-14 and 17-25 is respectfully requested.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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